PATENT SPECIFICATION

DRAWINGS ATTACHED

835,297

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COMPLETE SPECIFICATION

Tubular Heat Exchanger

We, MARSTON EXCELSIOR LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, and FRANK TROTTER, a British Subject, of 7 Palmers Close, Bilbrook, Nr. Codsall, Staffordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to heat exchangers, for example, tubular heat exchangers comprising a matrix of tubes disposed side to side in parallel relationship.

In certain applications of tubular heat exchangers it is necessary for the tubes carrying one component of the heat exchange pair to be made of a different metal or alloy from that of the other tubes in the system. Usually the different materials from which the tubes are made have different co-efficients of thermal expansion and it may thus arise that, during operation, differential expansion of the tubes causes severe stresses to be set up in the matrix.

According to the present invention, a heat exchanger comprising a plurality of parallel tubes or plates in which adjacent tubes or plates have different co-efficients of thermal expansion is provided with spacers between adjacent tubes, said spacers being thermally conducting and capable of flexing so as to maintain contact with the tubes under all conditions of expansion and contraction during use.

The spacers are thus of an inherently resilient construction so as to be capable of flexing in the direction in which adjacent tubes approach each other upon expansion and of returning to their original shape upon contraction. Advantageously the spacers are secured as by brazing to the tubes.

The invention is illustrated in the accompanying drawings of which:—

Figures 1 and 2 are respectively a partial end elevation and sectional front view of the heat exchanger.

Figure 3 is a detail view of the cross-section of a corrugation in the spacer elements.

[*Price 3s. 6d.*]

The apparatus shown is designed for heat exchange between liquid sodium and water or steam and employs stainless steel tubes 1 to carry the sodium and mild steel tubes 2 for the water or steam. Each tube 1, 2 comprises in cross-section two opposite parallel straight sides joined together at their ends by comparatively short arcuate side portions.

The stainless and mild steel tubes 1, 2 are mounted alternating with one another in the form of a block of say, eleven tubes with their axes parallel and spaced along a vertical line and with the flat surfaces of adjacent tubes directed toward each other.

Sandwiched between adjacent tubes 1, 2 are the spacers these being suitable lengths 4 of copper strip having corrugations which run transversely to the axes of the tubes 1, 2. The design of each corrugation is such as to appear in cross-section as a Z-shaped portion 5 connected at one end to its mirror image by a short horizontal connecting portion.

The copper strips 4 are bonded to the tubes 1, 2 by brazing, the flat surfaces of the tubes having been previously copper-sprayed for this purpose.

It will thus be seen that adjacent tubes 1, 2 are connected along their lengths to the flat upper and lower parts 6, 7 of the repeating sectional units 5 of the copper strip, the upper and lower parts 6, 7 being united by two inclined limbs 8 which act in the manner of springs and allow the tubes 1, 2 to approach or recede from one another through a change in their inclination.

WHAT WE CLAIM IS:—

1. A heat exchanger comprising a plurality of parallel tubes or plates in which adjacent tubes or plates have different co-efficients of thermal expansion, and thermally conducting spacer elements between adjacent tubes or plates capable of flexing so as to maintain contact with the tubes or plates without undue stress under conditions of expansion and contraction during use.

2. A heat exchanger according to claim 1, in which the spacer elements are secured to the tubes or plates.

3. A heat exchanger according to claim 2, in which the spacer elements are brazed to the tubes or plates.

4. A heat exchanger according to claim 3, in which the spacer elements constitute the primary means of effecting heat transfer across the plates or walls of the tubes.

5. A heat exchanger according to any of claims 1 to 4, in which the spacer elements are in the form of corrugated strips, each corrugation having in cross-section an S- or Z-shaped portion connected to its mirror image by a connecting portion.

6. A heat exchanger according to any of the preceding claims, in which the materials having different co-efficients of thermal expansion are stainless steel and mild steel.

7. A heat exchanger substantially as herein described and as shown in the accompanying drawings.

WALTER SCOTT.
Agent for the Applicants.

PROVISIONAL SPECIFICATION

Tubular Heat Exchanger

We, MARSTON EXCELSIOR LIMITED, a British Company, of Imperial Chemical House, Millbank, London, S.W.1, and FRANK TROTTER, a British subject, of 7 Palmers Close, Bilbrook, Nr. Codsall, Staffordshire, do hereby declare this invention to be described in the following statement:—

This invention relates to heat exchangers and more particularly to tubular heat exchangers comprising a matrix of tubes disposed side to side in parallel relationship.

In certain applications of tubular heat exchangers it is necessary for the tubes carrying one component of the heat exchange pair to be made of a different metal or alloy from that of the other tubes in the system. Usually the different materials from which the tubes are made have different thermal expansion properties and it may thus arise that, during operation, differential expansion of the tubes causes severe stresses to be set up in the matrix.

According to the present invention, a heat exchanger comprising a plurality of parallel tubes in which adjacent tubes have different thermal expansions is provided with spacers between adjacent tubes, said spacers being thermally conducting and adapted to maintain contact with the tubes under all condutions of expansion and contraction during use.

The spacers may thus be of an inherently resilient construction so as to be capable of flexing in the direction in which adjacent tubes approach each other upon expansion and of returning to their original shape upon contraction. Advantageously the spacers are secured as by brazing to the tubes.

Where the construction of the spacers is not such as to return to its original configuration upon contraction of the tubes it is necessary that they be secured to the tubes.

In the case of an apparatus designed for heat exchange between liquid sodium and water or steam it is convenient to employ stainless steel tubes to carry the sodium and mild steel for the water or steam. In one design, generally oval tubes are used each comprising in cross-section two opposite parallel straight sides joined together at their ends by comparatively short arcuate side portions.

The stainless and mild steel tubes are mounted alternating with one another in the form of a block of say, eleven tubes with their axes parallel and spaced along a vertical or horizontal line and with the flat surfaces of the adjacent tubes directed toward each other.

Sandwiched between adjacent tubes are the spacers these being suitable lengths of copper strip having corrugations which run transversely to the axes of the tubes. The design for each corrugation is such as to appear in cross-section as an S- or Z-shaped portion connected at one end to its mirror image by a short horizontal connecting portion.

The copper strips are bonded to the tubes by brazing the flat surfaces of the tubes having been previously copper-sprayed for this purpose.

It will thus be seen that adjacent tubes are connected along their lengths to the flat upper and lower parts of the repeating sectional units of the copper strip, the upper-lower parts being united by two inclined limbs which act in the manner of springs and allow the tubes to approach or recede from one another through a change in their inclination.

CARPMAELS & RANSFORD,
Agents for the Applicants,
24, Southampton Buildings, London, W.C.2.

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835,297 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

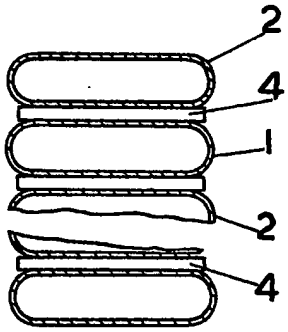

FIG. 1.

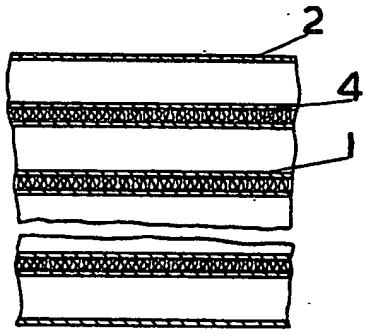

FIG. 2.

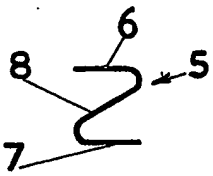

FIG. 3.